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(54) Ball and socket joints

(57) A ball and socket joint includes a housing (11) a ball pin (17) and a resilient plastics bearing cup (14). The bearing surface of the cup is protected by a rubber seal (19) retained by radially deformable retaining means in

the form of a resilient plastics retaining ring (21), the ball pin, bearing cup, seal and retaining ring being assembled together before insertion into the housing. The retaining means may comprise a groove wall (38, 44) formed integrally with the bearing cup (34, 41) (Figs. 3 to 5 not shown).

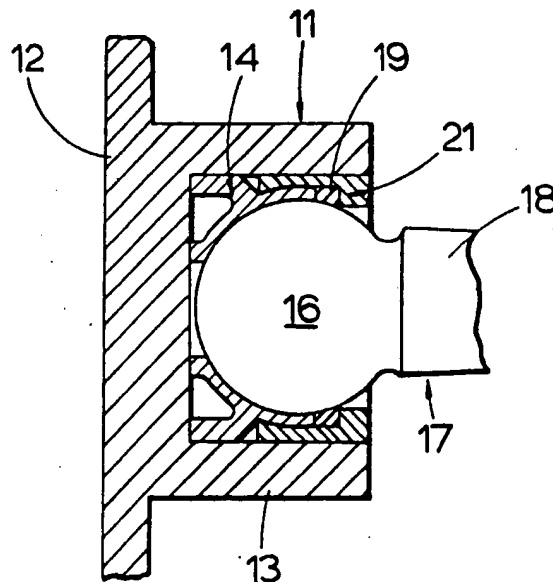


Fig.1

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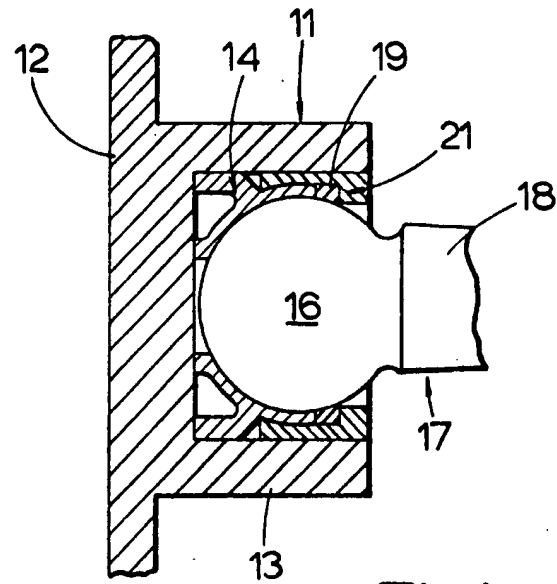


Fig.1

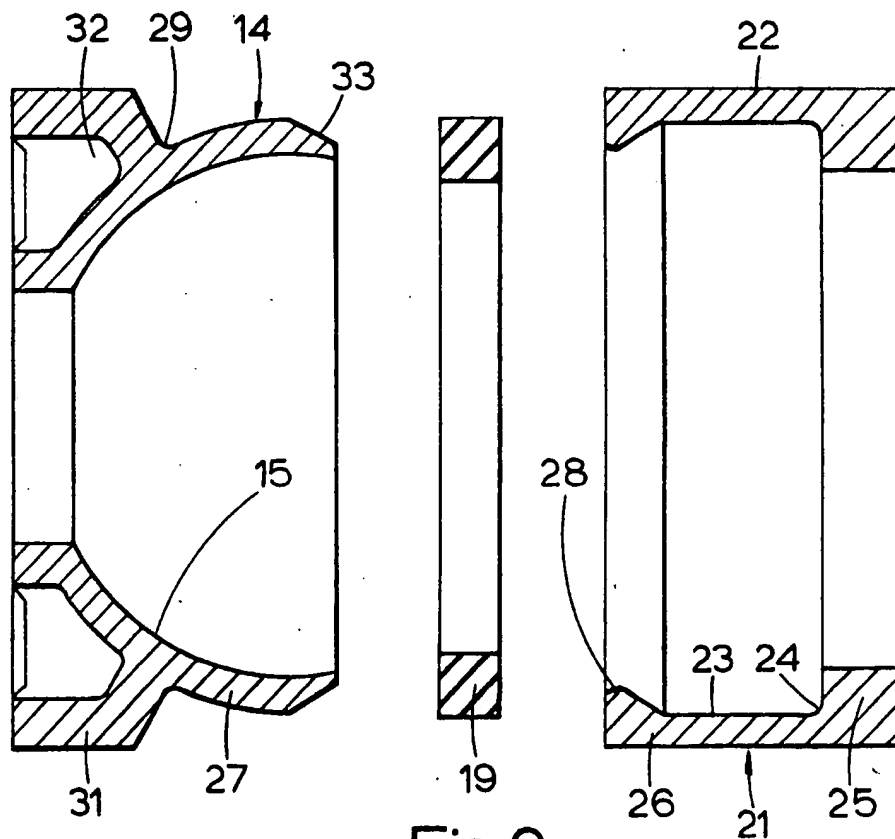
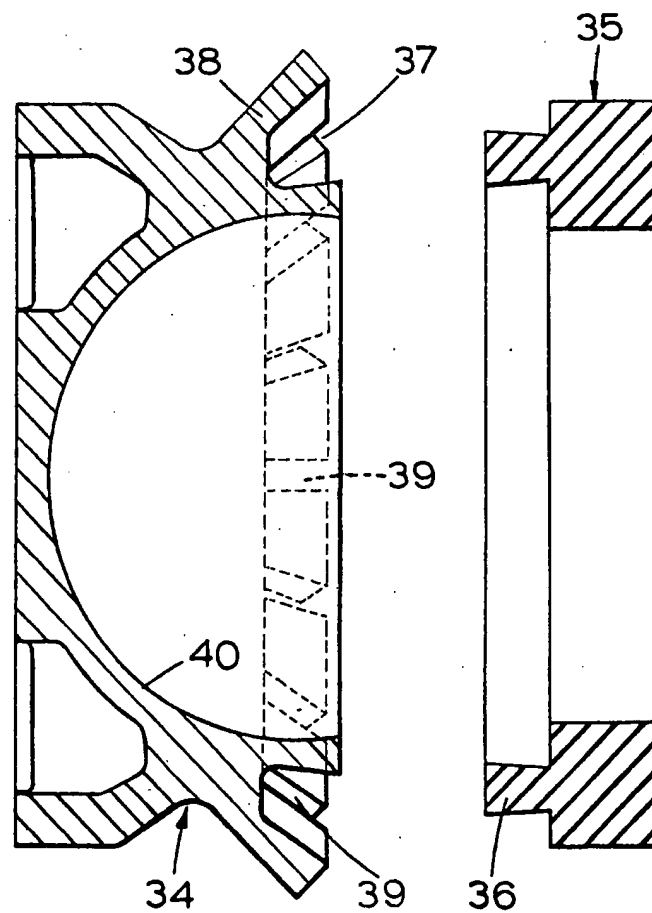
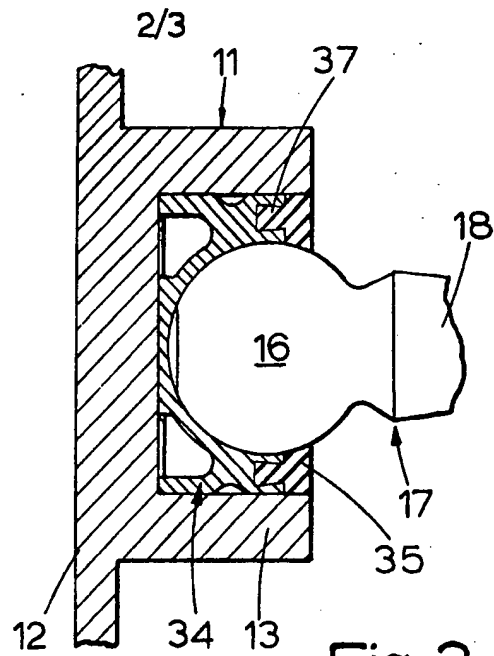


Fig.2

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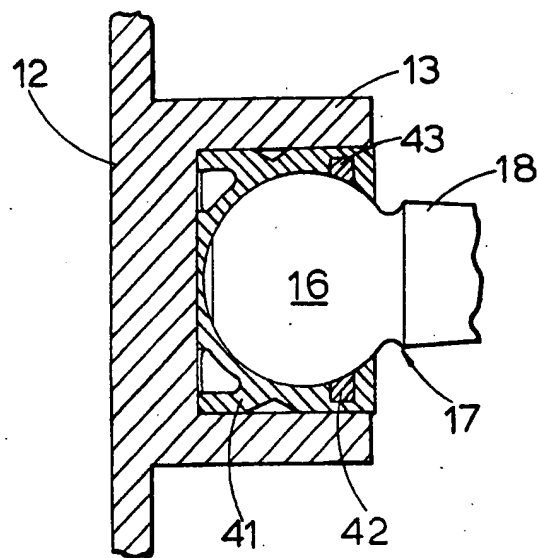


Fig.5

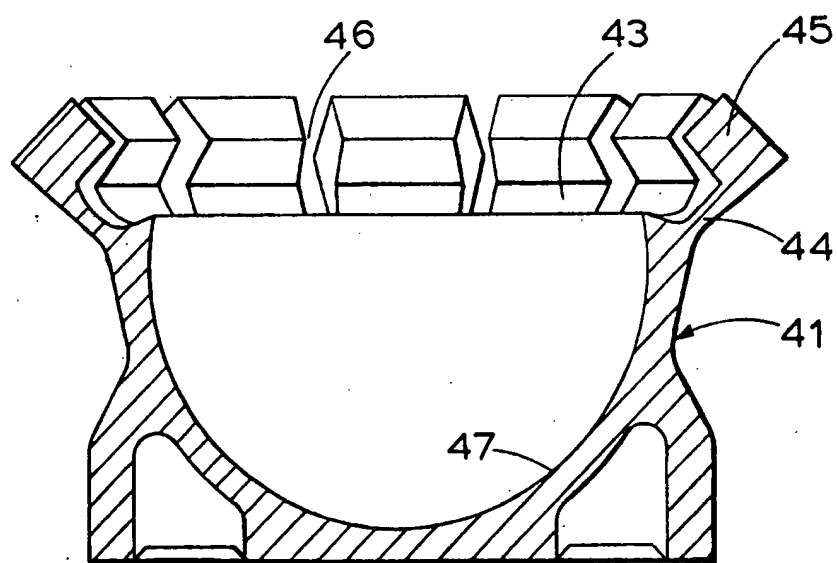


Fig.6

SPECIFICATION

Ball and socket joints

The invention relates to ball and socket joints of the kind comprising a cup-shaped housing, a ball pin having a shank extending through the open end of the housing and a part-spherical head and a bearing cup located in the housing and having a bearing surface for supporting the ball head for pivotal and rotational movement of the ball pin.

It is common practice to equip ball and socket joints of the kind described with a flexible boot or gaiter to prevent dirt entering between the shank and the mouth of the housing and to retain grease. However, boots are expensive and susceptible to mechanical damage. Annular seals which locate in a groove in the housing of a ball and socket joint are known but the groove requires machining and the joint does not lend itself to rapid assembly methods.

It is an object of the invention to provide a ball and socket joint of the kind described which is fitted with an annular seal and is simple in construction and assembly.

According to one aspect of the invention, there is provided a ball and socket joint of the kind described, wherein an annular seal is positioned between the open end of the housing and the bearing surface and is retained by radially deformable retaining means which co-operates with the housing to prevent removal of the seal when the bearing cup, the seal and the ball pin are located in the housing.

The retaining means may comprise a retaining ring having internal surfaces which support and locate the seal against the rim of the bearing cup and a rim portion which engages a rim portion of the bearing cup, a radial projection on one of said rim portions engaging with a corresponding recess in the other of said rim portions. Preferably the radial projection comprises an annular rib and the corresponding recess comprises an annular groove.

Alternatively, the retaining means may comprise a groove wall formed integrally with the bearing cup and extending axially from the rim of the bearing cup, the groove wall being flared outwardly when the bearing cup is in its free state before insertion into the housing. Preferably the groove wall is slotted axially.

According to another aspect of the invention there is provided an assembly comprising a ball pin, a bearing cup, a seal and radially deformable retaining means for a ball and socket joint according to said one aspect of the invention.

Examples of the invention will now be described with reference to the accompanying drawings, of which:—

Fig. 1 is a cross-section of one example of a ball and socket joint according to the invention;

Fig. 2 is an expanded section showing certain of the components illustrated in Fig. 1, drawn to a larger scale;

Fig. 3 is a cross-section of a second example of a ball and socket joint according to the invention;

Fig. 4 is an expanded section showing certain of the components illustrated in Fig. 3, drawn to a larger scale;

Fig. 5 is a cross-section of a third example of a ball and socket joint according to the invention; and

Fig. 6 is a cross-section of a bearing cup shown in Fig. 5, drawn to a larger scale.

With reference to Figs. 1 and 2, the ball and socket joint shown includes a cup shaped housing 11 having a base 12 and a cylindrical wall 13. A bearing cup 14 is located in the housing 11 and has a bearing surface 15 for supporting the part-spherical head 16 of a ball pin 17. The shank 18 of the ball pin 17 extends through the open end of the housing 11, the ball pin being capable of pivotal and rotational movement in the bearing cup 14.

An annular seal 19 of rubber or similar material is positioned between the open end of the housing and the bearing surface 15 is retained by radially deformable retaining means in the form of a retaining ring 21. The external cylindrical surface 22 of the retaining ring 21 is supported by the wall 13 of the housing 11 and an internal cylindrical surface 23 supports the seal 19 radially. The seal 19 is located against the rim of the bearing cup 14 by the internal radial surface 24 of a flange 25 on the retaining ring 21.

A rim portion 26 of the retaining ring 21 engages over a rim portion 27 of the bearing cup 14. To secure the retaining ring 21 in the socket housing 11 a radial projection in the form of a rib 28 on the retaining ring engages with a corresponding recess in the form of a groove 29 in the bearing cup 14.

The bearing cup 14 and retaining ring 21 are made of a resilient plastics material, e.g. Nylon 6 or 66. To reduce material costs and maintain substantially even wall thicknesses, a cylindrical projection 31 provides location in the housing 12 and is supported by radial webs 32.

To assemble the joint, the ball pin head 16 is located in the bearing cup 14 and the seal 19 and retaining ring 21 and passed over the ball pin shank 18. The retaining ring 21 is then pushed into position on the bearing cup 21, a chamfer 33 forcing the rim portion 26 of the retaining ring 21 to deform radially before the rib 28 snaps into the groove 29.

In the ball and socket joint shown in Figs. 3 and 4 the socket housing 11 and ball pin 17 are substantially identical to those shown in Figs. 1 and 2 and will retain the same reference numerals. A bearing cup 34 is generally similar to bearing cup 14 and is also of resilient plastics material.

A seal 35 of rubber or similar material is of generally rectangular cross section with an axially projecting annular rib 36 of dovetail section on one side face. This rib 36 is engaged in a groove 37 in the rim portion of the bearing cup 14. The normally axially extending outer groove wall 38 is flared outwardly when the bearing cup is in its free state before insertion into the housing 11, i.e. as shown in Fig. 4.

The outer groove wall 38 has axial slots 39 which, together with the resilience of the material, allow the outer groove wall 38 to act as radially deformable retaining means for the seal 35.

5 To assemble the ball and socket joint shown in Figs. 3 and 4, the ball pin head 16 is inserted into the bearing cup 34 and the seal 35 is passed over the ball pin shank 18 so that the rib 36 projects into the groove 37. These components are then
10 pushed into the housing 11, the side wall 13 deforming the outer groove wall 38 radially to clench the rib 36 and thus retain the seal in position between the bearing surface 40 and the open end of the housing.

15 The ball and socket joint shown in Figs. 5 and 6 also uses a socket housing 11 and ball pin 17 which are substantially identical to those shown in Figs. 1 and 2 and the same reference numerals will be retained. A bearing cup 41 is generally
20 similar to bearing cups 14 and 34 shown in Figs. 1 to 4 and is also of resilient plastics material.

A seal 42 of rectangular cross-section is engaged in a groove 43 in the rim portion of the bearing cup 41, the normally axially extending
25 outer groove wall 44 being flared outwardly when the bearing cup is in its free state before insertion into the housing 11, i.e. as shown in Fig. 6. A normally radially extending groove wall 45 on the side of the seal 42 away from the bearing surface
30 15 is formed integrally with the axially extending wall 44. Slots 46 in the groove walls 44 and 45 together with the resilience of the material allow the groove walls to act as radially deformable retaining means for the seal 42.

35 To assemble the ball and socket joint shown in Figs. 5 and 6, the ball pin head 16 is inserted into the bearing cup 41 and the seal 42 is passed over the ball pin shank 18 to lie loosely in the groove 43. These components are then pushed into the
40 housing 11, the side wall 13 deforming the outer groove wall 44 radially to retain the seal in position between the bearing surface 47 and the open end of the housing.

The ball and socket joints according to the
45 invention are particularly suited to use in a clutch release mechanism of a vehicle transmission in

which case the housing 11 may be integral with the clutch bell housing or some other fixed transmission component. Hence the invention
50 extends to an assembly of the parts described above for insertion into a housing.

CLAIMS

1. A ball and socket joint comprising a cup-shaped housing, a ball pin having a shank extending
55 through the open end of the housing and a part-spherical head and a bearing cup located in the housing and having a bearing surface for supporting the ball head for pivotal and rotational movement of the ball pin, and wherein an annular
60 seal is positioned between the open end of the housing and the bearing surface and is retained by radially deformable retaining means which co-operates with the housing to prevent removal of the seal when the bearing cup, the seal and the
65 ball pin are located in the housing.

2. A ball and socket joint according to Claim 1, wherein said retaining means comprises a retaining ring having internal surfaces which support and locate the seal against the rim of the
70 bearing cup and a rim portion which engages a rim portion of the bearing cup, a radial projection on one of said rim portions engaging with a corresponding recess in the other of said rim portions.

3. A ball and socket joint according to Claim 2, wherein the radial projection comprises an annular rib and the corresponding recess comprises an
75 annular groove.

4. A ball and socket joint according to Claim 1,
80 wherein said retaining means comprises a groove wall formed integrally with the bearing cup and extending axially from the rim of the bearing cup, the groove wall being flared outwardly when the bearing cup is in its free state before insertion into
85 the housing.

5. A ball and socket joint according to Claim 4, wherein the groove wall has axial slots.

6. A ball and socket joint according to Claim 4 or Claim 5, wherein the seal has an axially
90 extending retaining rib which is engaged by the groove wall.